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Journal of the Society of Arts.

FRIDAY, JANUARY 12, 1854.

REPORT OF COMMITTEE ON INDUSTRIAL PATHOLOGY ON TRADES WHICH AFFECT THE EYES.

In presenting their Report on Industrial Pathology, the Committee appointed to undertake that subject beg to recall to the memory of the Council that they determined last year to direct their special investigations to the injuries resulting from handicraft work to one organ only, namely, the eye. In the general circular which they recommended to be distributed, this was pointed out, and consequently the greater part of the correspondence which they have received relates, as was intended, to lesions of that part. The report therefore is, for this designed reason, short and partial. But it is also shorter and less pregnant with information than the Committee anticipated. The subject of Industrial Pathology was so new to the public, that much irrelevant matter was introduced into the correspondence, and many classes from whom it was hoped a good deal might be learned, did not undertake to reply to the questions.

One cause, however, for the shortness of the Report may be viewed as a fair subject of congratulation. It appears, from the constant repetitions by different persons of the same lesions, and the very little novel or original information that has been elicited, that the important organ of vision is much less injured directly by handicraft operations than the Committee thought. Many of the affections quoted seem due rather to ignorance or neglect of well-known hygienic laws, than to anything essentially connected with the occupation of the workmen.

Another subject of congratulation also occurs to them, viz., that all the results complained of seem capable of being met by simple, cheap, and universally attainable means: no alterations of modes of manufacture, no interference with the natural liberty of the master to have work done in the cheapest way, is necessary; but merely such precautions as it is monstrous not to adopt when once known.

In returning their best thanks to the correspondents who have assisted them in this work, the Committee beg to explain that the omission of many portions of the replies sent, in some cases the omission of the reply altogether, is due not to their want of appreciation of the value of the information given, or of respect for the contributor, but solely to carry out the rule of avoiding repetition.

Mr. Dixon, surgeon to the Royal London Ophthalmic Hospital, reports:—

In a very large number of those who apply to the Royal London Ophthalmic Hospital on account of what they term "weakness of the sight," the defect is owing to mere *over-use* of the eyes. I mention "over-use" rather than any special *trade*, as the exciting cause, for every day's experience teaches us that needlework, and other occupations requiring close attention to minute objects, may be followed without injury to vision, provided due moderation be observed.

Tailors are, perhaps, of all persons, the most liable to exhaustion of visual power from over-use of the eyes. The length of time they work without intermission—often sewing black materials for many hours together—their constrained posture, which obstructs the proper movements of respiration, and so causes congestion about the head and eyes—the want of fresh air in the heated rooms where they are often crowded together—the dram-drinking to which they so habitually resort for dispelling the sense of exhaustion and weariness induced by the want of a due supply of oxygen—all concur in eventually producing an inability to sustain the effort of observing minute objects; while, at the same time, the close and heated atmosphere by which they are surrounded during their hours of labour, makes them additionally susceptible of cold when they go into the open air: hence they are peculiarly liable to attacks of "catarrhal ophthalmia."

Needlewomen are placed under conditions so similar to *tailors*, that both classes are liable to very much the same forms of disease, as regards exhaustion of visual power and susceptibility to "catarrhal ophthalmia."

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Among *Dressmakers* the custom almost universally prevails of making up their white and coloured materials during the day, and reserving all black work for the evening. They allege, as a reason for this, that white fabrics are apt to get soiled if exposed to the smoke of gas. It is certain, however, that the strain on the eyes from working on black by artificial light is much more severe than from doing such work by daylight; and it would, therefore, be a great boon to those employed in dressmaking establishments if the proprietors would allow all articles of mourning to be made up during the day, and white materials, and those of such colours as are readily distinguishable by artificial light, to be reserved for the evening.

Improved ventilation (so essential to the health of the workwomen) would doubtless obviate all risk of soiling the more delicate fabrics by smoke or unburnt gas.

In large tailoring and dress-making houses, where a number of persons work in one room, much fatigue of the eyes arises from that *superabundance of light* which gas can so readily be made to afford. In such cases glass shades, or chimneys, tinted with a very faint blue, by intercepting the red rays of the gas flame, would afford great relief.

Those who work at home commonly suffer from an opposite cause,—namely, an *insufficient and unsteady* light; a flickering candle being usually the sole means of illumination within the attainment of the solitary needlewoman.

From the nearness of our hospital to the district of Spitalfields, nearly all the *weavers* who suffer from affections of the eyes come under our notice. These people habitually suffer from long hours of work and want of exercise, Sunday being, to many of them, the only day on which they leave their room. Failure of sight from over-use of the eyes is very common among them, insufficient lighting of their workrooms in the evening being a frequent cause of the overstraining of the organs.

Boot and *shoe makers* suffer in the same manner.

Constant attention to minute objects, which, at the same time, are brilliant in themselves, and frequently illuminated by powerful artificial light, exposes *watchmakers* and *engravers* to premature exhaustion of visual power. During the short and dark days of winter they are forced to em ploy lamplight, and even this they often concentrate by means of a glass bull's-eye.

The ingenious contrivance for intercepting the red rays of the flame, invented by Mr. Rainey, the well-known microscopical observer, would doubtless, very much lessen the injurious effects of their occupation.*

Copying clerks, who write for the law-stationers, frequently come under my notice, in consequence of weakness of sight from over-work.

Before quitting the subject of artificial light, I would allude to an inconvenience of which *Compositors* engaged in newspapers-offices have complained to me,—namely, the unsteady light emitted by the jets of gas, in consequence of their being exposed to currents of air without the protection of shades or chimneys. It seems only necessary to draw the attention of the proprietors of our great printing establishments to this inconvenience to enure its being rectified.

Excess of light no doubt acts prejudicially upon persons occupied at furnaces, as *Glass-blowers, Smelters, Assayers*—but it seems almost impossible to suggest a remedy, since any kind of tinted spectacles which would modify the glare of light, would, at the same time, prevent the workman from knowing when the glass or metal had arrived at its proper state of fusion, a point mainly to be determined by the intensity of light which the melted substance emits.

Among all the classes of persons I have mentioned as occupied in various ways upon minute objects, instances occur in which the fatigue and distress of the eyes arise not so much from the actual amount of work as from the patients' attempting to execute it, after a certain time of life, without the assistance of glasses suited to correct the gradual change of focus which the eye itself undergoes. Some persons, even in early life—in childhood—who have very acute sight for distant objects, require the aid of slightly convex glasses to enable them to sustain, for any considerable time, the effort of observing minute objects which are near them. This assistance is still more frequently necessary in adults who have passed the age of 50. With convex glasses, accurately adapted to their peculiar focus, such persons are frequently able for many hours to follow their occupation of needlework, &c., when, without such aid, their sight would wholly fail after a few minutes' application. In like manner short-sighted persons suffer from attempting to work without suitable concave glasses.

With respect to *Mechanical injuries* to the eyes, resulting from particular occupations, I may observe that such accidents frequently come under my notice in consequence of the large number of patients who frequent our hospital. In 1850 their number was 9,204; in 1851 it rose to 11,071 (the increase of 1,867 affording a curious illustration of the influx of persons from remote parts of the country into London during the year of the Great Exhibition). In 1852 the number was 10,595; in 1853, 10,058.

During this period the number of foreign bodies, chiefly fragments of metal, which have been removed from the eye, has fluctuated between 500 and 600 every year.

Metal-burners, millstone-dressers, and *smiths*, are the persons most subject to have minute chips of metal driven into the cornea. *Engineers*, in using the chisel, are liable to much more serious injuries, in consequence of the larger size of the fragments they chip off. I every year see several cases in which eyes have been wholly lost in this manner. *Masons* suffer chiefly from chips of stone projected against the eye, or, still more frequently, from little particles of sand or grit which become lodged between the upper lid and the eyeball, and require surgical aid for their removal. This lodgment of small bodies beneath the eyelid—an accident of comparatively trifling importance, is one to which *Bricklayers* are peculiarly liable. A much more formidable injury which befals these persons, and others occupied in building, is the intrusion of lime into the eye, which frequently causes instantaneous and permanent blindness.

The blows which *Masons* receive on the cornea are often of serious moment, and may lead to severe inflammation of the part. This inflammation is usually destructive in proportion to the feebleness of the patient's constitution, or state of body at the time the blow is received, and the worst cases I meet with occur in *paupers* who are set to break stones in the yards of workhouses. These accidents might be averted if all persons so employed were obliged to use "goggles" of wire gauze, which would effectually defend them from injury, and at the same time enable them to see quite sufficiently for performing such coarse work.

In this report it may be observed that the only instances given of harm resulting from the irremediable nature of the occupation, are those of smelters, assayers, and workers in metal similarly employed, where the bright light that hurts the eye *must* be seen by the eye to enable the artisan to judge of the progress of his work. Moderate employment in watchmaking, engraving, and other minute work is not stated to be noxious, but only such over-exertion as must be equally objectionable on the score of general health. The wearing of guards not at all likely to impede the work (for it may be remarked that in some parts of Germany they are universally worn), is said to be enough to prevent the frequent injuries to the eyes which stone-breakers experience. Chips of metal might be guarded against in the same way, especially if, when the metal is iron, magnetised wire nets were used. The strain of vision induced by working with the needle on black stuffs by night suggests its own remedy, but would be still further reduced by the use of sewing machines, which have no eyes to lose.

On this subject some suggestions contained in a report by Mr. E. Cousins, of Camden-town, are interesting and valuable.

Mr. Cousins suggests that:—

> Needlewomen, embroiderers, and lacemakers should work in rooms hung with green, and having green blinds and curtains to the windows. When in North China, I became convinced of the very great advantage with which this rule has been adopted by the exquisite embroiderers of that part. Their books of patterns are frequently called *Books of the Lady of the Green Window.*

He also says:—

> Needlewomen would find great advantage from changing the colour of their work as frequently as possible. The *rationale* of this is found in the law that variation of stimulus is necessary to preserve the tone and health of any organ of sense, and that prolonged application of the same stimulus exhausts it.

With reference to the remote causes of diseases of the eyes, he says:—

> The surgeons of Brussels are well aware of the injurious consequences to the eyes resulting from long continuance of work in the sitting posture, as adopted by the lace-workers of that capital. My friend, the late M. Cunier,

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* This apparatus is made by cementing together, by means of Canada balsam, four pieces of glass: the first dark blue, without any tinge of red,—the second very pale blue, with a slight tinge of green,—the third and fourth to be thick plate glass, perfectly colourless.

referred the congestive diseases of those organs so frequently seen there to the indirect influence of this cause, producing stasis of the circulation in the abdominal organs, and secondary venous congestion of the choroid, &c.

Here, again, the sewing-machine seems to be called for, or, where that is not available, stands or frames to support the work, and enable it to be done by persons in the erect posture for at least a portion of the day.

It may be remarked, in passing, that the sitting posture, especially that doubled-up sitting posture assumed by laceworkers, is otherwise injurious, producing congestion of the abdominal organs, hæmorrhoids, &c.

With respect to the effect of lacemaking and embroidery the Committee beg to refer also to the evidence of Mr. R. D. Grainger, published in the Parliamentary Report of the Children's Employment Commission, in 1841. It is a painful sight in Belgium, as in England, to see children's hands engaged on a lace-cushion almost before their feet can support them in an erect posture.

With respect to Mr. Dixon's inclusion of compositors among those who suffer from flickering light, it is right to say that a great improvement has latterly taken place in this respect. In reporting the conversation which took place in the Society's room after the reading of a paper on "Industrial Pathology," by Dr. Chambers, the editor of the *Medical Times* stated that none of their compositors suffered in this way. The foreman, also, of the printing-office of Mr. Cassell, on Ludgate-hill, remarks, in a letter to the Committee :—

> It is very seldom compositors work without a shade. On questioning some of our workmen they reply that the *shades* we use render it much pleasanter to work than the naked flickering gaslight; still we cannot learn that blindness has been the consequence of the latter. We find the glass funnels economical, even with the shades; but the compositors dispense with them on account of the heat produced. The open shade is all we use, and we never hear any complaints.

At the printing-office of the *Times* newspaper, shades and chimneys are used, and appear to be entirely successful. Among the 200 men employed, Mr. Harrison, the master printer, reports, and the statistics of the sick fund show, that but one man has been invalided for defective vision, and he is a man of 65, with a cataract.

At Messrs. Clowes's shades made of white paper, by the men themselves, are very general, and the burners are placed at a proper height above the head.

Mr. Moore, surgeon to the Middlesex Hospital, adds to the catalogue of trades injurious to the eyes—

> Soda-water bottling, which is a dangerous occupation, from the occasional bursting of the bottles, and escape of the corks.

He says, too,—

> Washerwomen suffer a good deal from draughts, and consequent catarrhal ophthalmia.
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> Engineers are sometimes laid up in consequence of encountering a blast of steam.
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> Diseases of the eye, and especially *granular lids*, are apt to be particularly severe and intractable in the Irish, certainly more—but by no means only—when they work much in lime.

An annual report on the causes of diseased eyes among the patients at St. Mary's Hospital from Dr. Graily Hewitt, the then surgical registrar, shows that of 88 cases, 9 arose from overwork of the vision in occupations not generally injurious; 5 arose from chips of metal, glass, or other hard substances in the eye; 3 from blows; 2 from exposure to heat; and 69 to constitutional causes, cold, poverty, &c., independent of the occupation. The details of the report, and the nature of the lesions, are irrelative to the present purpose.

T. J. Downing, working bookbinder, reports that—

> Formerly the finishing department of the trade was carried on with the use of charcoal fires, which were pernicious to the eyes. These have been superseded by gas-stoves, which are much less so. Finishers are observed often to be near-sighted, occasioned, it is thought, by continually working upon gold-leaf, the glare of which produces this result.

In a communication principally relating to other diseases of the grinders of steel goods, Mr. Wilson, foreman to Messrs. Rodgers, of Sheffield, remarks :—

> The grinders are liable to get particles of steel in their eyes. But, as a prevention, some of them wear *very large* spectacles of plain flat glass.

A truly rational and cheap preventive! Speaking alse of furnacemen, he says :—

> I know some whose sight is affected by the heat and light.

J. E. Sinyard, secretary to the working-tailors' society, Ring-o'-Bells, Bradford, attributes the diseases of the eyes which tailors suffer from, to—

> Overstraining the organs, exposing them to the glare and heat of gas, bad ventilation, dust, and intemperate habits,—including snuff-taking. Although addicted to it myself, yet I think it causes the eyes to be strained by the frequent blowing of the nose.

He says, too :—

> Fine work in thick cloth, velvet, &c., causes the eyes to be inflamed, watery, and the vision confused. Spectacles are considered to be beneficial by daylight, but positively injurious by gaslight, the glass being heated by the necessary close proximity to the light.
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> I have long thought that much good might be done by placing a reflector over each burner, having a small tube reaching from the top of the reflector to the outside of the building. I think the reflector would cast down the light from the eyes upon the work on the knees, and the tube carry off the heated air, like a flue.

Mr. George Wilson, of Price's Candle Manufactory, Belmont, Vauxhall, writes :—

> The only suggestion I can make as to trades affecting the eyes, relates to glass-blowing. We require a good deal of this work for the purposes of our manufacture, and had

> a number of our boys taught to work the blow-pipe. The oil-lamp used for heating made a bad unwholesome smell —we substituted gas, and then found that the eyes even of those who had been at the work but a short time became red and sore. We gave them dark-blue spectacles, which, so far as our experience goes, is an effectual remedy.

The smell of oil is no doubt unpleasant, but it may be questioned whether Mr. Wilson is right in calling it "unwholesome," an epithet more pertinent to the residuary gases escaping from the usual semi-combustion of coal gas. The effect of gas light on the eyes is worth more inquiry than it has yet received. Many who have had gas laid on in their servants' apartments, find that their female domestics suffer from affections of the eyes, which are sometimes catarrhal, sometimes amaurotic. The reason that females complain more than males, is probably, the nature of their evening occupations. The Committee have no written evidence on this point, but they have heard that at some schools, where gas is used for lighting the rooms, the boys are observed to become short-sighted. An explanation of the difference between gaslight and other light is given in another communication. (See Mr. W. W. Cooper's Report, page 124.)

Dr. Caplin, of Manchester, says that :—

> If we take the trouble to investigate the effect of light on the eyes, we shall find that it is not so injurious as is generally thought. An organ, whatsoever it may be, is not injured so long as it can perform its functions with facility. The stress on the eyes results from *want of light*; and whenever the light falls on the object we want to see, not on the eyes themselves, it does not prove hurtful.
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> I have known many persons accustomed all their lives to the most minute work, such as engraving, whose eyes were neither affected nor impaired. This fact is in accordance with the law of physiology, by which the strength of an organ is in proportion to its activity.
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> Oblique and bad light are the cause of affection. But it may be remedied by altering the window, or changing the place or position of the worker. The foregoing remarks are not intended to exhaust the subject, but are mentioned merely for the purpose of pointing out the necessity for directing our investigations to the discovery of primary causes, instead of forming our diagnostic on secondary effects.

The question whether the eye, or any of the other organs of sense, is capable of improvement in proportion to its use, or whether, like a human mechanical contrivance, it wears out by employment, is a very serious one. A great deal of our conduct in daily life depends on the way we answer it to ourselves. It is probable that the "wearing out" contrasted in the popular saying with "rusting out" is often falsely attributed to the human body, and that perfectly healthy organs are made more efficient by use—provided that such use does not diminish the nutrition of the system; but, at the same time, local injury is certainly experienced in many parts of the body, especially the eye, by working too long hours. The explanation appears to be this, viz., that after the body has been long employed, sufficient vigour does not remain in each separate organ to enable it to do its duty—it cannot be called healthy after the general strength has been exhausted. "Overwork" means working with the eye in an unnatural condition.

To answer more completely this and other questions concerning lesions arising from occupations, it would be desirable to collect a list, not only of such trades as injure particular organs, but of such as benefit them. In a communication from James Cowell, a shipwright at Newcastle, an opinion is expressed that his employment is peculiarly beneficial to the sight. It is said :—

> It is a rare thing to find a shipwright weak-sighted, or shortsighted, who is not naturally so. I understand also that shipwrights are much quicker sighted than sailors, and that in consequence they are preferred to them for steering vessels at sea.

As a proof, however, that such statements concerning their own trades are to be received with caution, the Committee hear, on inquiry from Mr. Wigram, of Blackwall, the extent of whose experience puts doubt out of the question, that shipwrights are never employed at sea as steersmen, or in any way out of their own line, and that he has never heard of their occupation improving the sight. Mr. John White, of Cowes, also thinks this must be a "popular error," perhaps originating in shipwrights being noted for having a quick eye in detecting an unfairness in their work. It may be remarked that some medical men attribute to mere *superabundance* of light, however natural, some injuries of the eyes. Thus, Mr. France, lecturer on Ophthalmic Surgery at Guy's Hospital, in his answer to the circular, mentions as suffering from "excessive illumination"—

> *Sailors*, especially in tropical stations, blacksmiths, cooks, and others tending large fires, metal-polishers, and engineers, jewellers, harvesters.

Mr. France further says :—

> If the Society of Arts would exert its influence with the public to abolish the present custom of decorating shop fronts with broad plates of brass, they would effect an important oculo-sanitary improvement. These brazen mirrors, when in summer-weather the sunshine is perfectly reflected from them, are in truth a very serious evil to the vision of passers-by.

He also suggests that arrangements should be made to enable persons engaged much in minute work,—

> such as sempstresses, to execute as large a portion of their task as possible by daylight, and, for that end, to adopt very early instead of late hours of employment. The less artificial light is used the better. That which is used should be above the level of the face, so as to allow, as in nature, the brow, and lashes, and iris, to shelter the pupil, and thereby the expansion of the optic nerve from the *direct* rays. Neglect of this precaution is injurious in two ways;—first, the influx of such rays continued for a considerable period tends to exhaust the normal susceptibility of the retina;—and, secondly, by eclipsing the brilliancy of the rays reflected from the work, so that the workman is induced to increase the light to a degree otherwise quite superfluous, dazzling, and pernicious.

The Committee take the liberty of suggesting that in the investigations concerning artificial lighting, the effects of temperature, as well as of glare, upon the eye-ball, should be taken into consideration more carefully than is usually done, and perhaps also the influence of the gaseous products of combustion upon the conjunctiva.

As respects the effect of heat on the eyes, reference may be made to the possible injury resulting from the heat and irritating smoke of tobacco pipes, when, for the convenience of holding in the teeth while the hands are employed, they are made short. The bad eyes of cobblers are attributed to this cause in a long communication on the health of that class, written by one of themselves.

J. Dacres Devlin says :—

> A shoemaker, a voracious smoker, having been compelled to apply, through the failure of his sight, to the celebrated oculist, Dr. Alexander, this gentlemen, immediately he held the head of the wretched sufferer before his observation, exclaimed, "Why, you have brought this all upon yourself! You are your own eye-destroyer! That short pipe which you stick in your lips is doing it all. Throw that bad and filthy thing aside! There can be no remedy for you until you drop this vile propensity. Why, man, you are burning your very eyeballs out of their sockets." So he told him, and then and afterwards he did what he could for his patient; but all unavailingly as regarded a complete restoration of sight; and now, in his visual benightedness, he is compelled to sell matches in the streets of London.
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> Another such case has come to my knowledge of a workman who had his tuition under one of the best hands (as a *smoker*) in the west end of London (and that is saying a good deal), but his eyesight failing some twelve or fifteen years ago, he had to leave that, the palace-part of London, and get employment at coarser work in the Borough. Latterly, however, even this has been denied him, and he is compelled into the shuddering necessity of plying the varying occupations of a patterer in the New-cut.
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> I had a closely similar account of a shoemaker the other day—even since the circular of the Society of Arts came into my possession. This person is well known among proficients of the smoking art, so that he has received the nickname of "Bellows Dan."
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> He can now follow his shoemaking no longer—his eyes are so damaged; while he has been distinctly told by the Dispensary doctor, to whom he has been forced to turn for help, that he has "burnt all the nerves out of his head." For in this way the story has been repeated to me—meaning, doubtlessly, by the word *head*, the *eyes*, just as Dr. Alexander stated the first-mentioned case to be.
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> As the habit is indulged in during the long working hours of week after week, the bowl of the pipe closely sideling up against the leather-like cuticle of the right or left cheek, as it may be, the fine nervous system of the eye, as has already been mentioned, must even be more offended and damaged, and eventually, perhaps, completely destroyed.

The Committee would not wish to assign to the habit, which this writer so energetically denounces, the whole of the effects produced in the above-quoted cases. As far as they can ascertain by inquiry, the local injury done by tobacco-smoking would be more likely to be exhibited in the lids than in the eye-balls or nerves of vision; but the constitutional influence of the drug on the nervous system must not be entirely passed over.

As respects the employment of artificial light by the shoemaker, the same writer remarks that a great improvement has taken place of late years by the introduction of what is called the "Scotch lamp," suspended from the ceiling, instead of the "flats" formerly employed, and that gas also is becoming usual even among those who work at home.

The sameness of colour on which fine work is done, is stated to be especially trying to females employed in ladies' shoe-binding; and the very long hours at which they work is also viewed as a frequent cause of weak sight. As regards a remedy—

> The writer does not think it possible by sewing-machines, or any other kind of mindless agency, to be able to command such an amount of variable expertness as that which the fingers, following the direction of the mind, are required to perform.

It appears that the work now in general demand, is, however, less trying to the eyes than the fine stitching required for the high-heeled shoes of our forefathers; for the same communication continues :—

> Nor is the maker of the now full dress boot for the gentleman obliged to do, as formerly, in respect of the showiness of the awl-work, which was required in the fine parts, (this technical term meaning the stitching and finishing off of those stiches, as the same are seen displayed on what is called the *welt*), and, as every reader will be able to apprehend, who is old enough to remember the appearance of the gentleman's boot in the sole part 20 years ago, the blacking brush even being made to respect those beautiful proofs of the work-man's skill in stitch-setting and "jigering." Less fortunate, however, than the *woman's man*, and *man's man*, has the *boot-closer* been in regard to his branch of the general trade, on comparing the last 15 or 20 years with the immediately preceding period; and which disadvantage is mainly, if not solely, to be attributed to the introduction of that kind of leather called "patent." A material so beautiful to the eye has necessarily excited to the finest mode of stitching, and
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> the substance so stitched upon having a shiny jet-black surface, thereby causing the sight of this special artizan to be greatly tried.

It is scarcely necessary for the Committee to remark, after what has been before said, that they cannot agree with the opinion that fine work is in itself an evil to the trade. It wears out the shoes faster, as our correspondent afterwards remarks, and therefore gives him more work, and that highly skilled instead of mechanical work. The danger to the eyes may doubtless be obviated by moderation in their exercise.

Though doubting the possibility of using sewing-machines, the writer mentions some mechanical contrivances which have aided much the shoemaker and spared his eyes of late years. Among others the "pinkers" used for "stabbing."

> These pinkers being a series of nicely-cut teeth formed upon the thin edge o fa flat steel bar. * *

Another contrivance is the "wheel-pinker." This is to run along the edged places which require to be stabbed.

This pinked surface is rubbed over with chalk, by the bright colour of which the holes are clearly indicated, and so the eyes saved.

In shoemakers the sight of the eye is sometimes completely destroyed by a particular sort of liability, that of the unexpected breaking of an awl. * * * Those who habituate themselves to press the head down very closely over the knees when at work, or are so compelled from shortness of sight, being in the greatest danger from such accidents.

J. D. Devlin thinks that the great remedy for evils arising from handicraft employments lies in the diffusion of knowledge concerning them, and this end he thinks is most likely to be attained by the publication of cheap writings addressed to special trades—not to artisans in general, but to particular sorts of artizans, which he says will be valued and read.

No broad cure is to be arrived at but through the agency of the easily-to-be purchased "*class-journal;*" each of the more prominent sections into which industrial exertion has been thrown, must have its own distinct medium of individual inter-communication; * * * for only through such class-publications can worker with worker freely commune.

A series of papers of this character, each having its own distinct purpose, printed under the auspices of the Society of Arts, and sold at the lowest possible paying price, could not, as I feel, but confer a very extensive range of benefit; while, on the other hand, these very different matters, when ultimately brought together in a volume or volumes, and so addressed to the social philosopher in their wholeness, must come to him with the deepest claims on attention.

This last suggestion bears so pointedly on the interests of the working classes in general that the Committee commend it strongly to the attention of the Council and the Society at large, but will not add any remarks of their own to the heartfelt energy of their correspondent.

The observations in the subjoined communication from Dr. Gibb, of Guildford-street, have much originality. It may be remarked that the injuries attributed to the action of potash in a trade not here indigenous arise also in chimney-sweeps in England from the ammonia, a still more stimulating alkali, in soot, getting into the eyes:—

The occupation of "ashes boys," one not known, I believe, in this country, but very common throughout the towns and cities in Lower Canada, is exceedingly injurious to the eyes.

The ashes remaining from the various kinds of wood used as fuel are saved and sold to those boys, whose eyes become diseased from the light powdery dust finding its way on to the surface of the eye, and between the lids. The particular composition of these ashes is the source of the inflammation (which may be said to be chronic from the commencement); they contain the salts of potash in large quantity, which acts as a direct caustic. It is very common to see these boys without any eyelashes, and the lower and upper lids thickened and very red, with constant dribbling of tears.

The occupation, although not known here, is of sufficient interest to mention, in its connection with other sources of injury.

I am quite certain that many—in fact, a large number—of artisans, who are exposed to the influence of dust, grit, chips, splinters, &c., from the nature of their occupation, suffer more in proportion from the absence of beards and whiskers than those who possess these appendages. This is a fact which is becoming established every day. I have followed this observation out to some extent in practice, in the treatment of diseased eyes from dust, &c., with shaven faces, where there appeared to be at the same time a weakness in the organ of vision from the latter cause. On the growth of the beard, when the affection of the eyes was cured, the weakness disappeared, and many whose eyes were before diseased through the nature of their occupation, after obtaining beard and whiskers, were to a great extent exempt from a return of their eye affections.

This may be attributable to two causes:—the *first*, the protection afforded to the face by the hair, the strengthening and tonic influence imparted in consequence to the nerves of the face and eyes, and the general improvement of the health from the comfort experienced in wearing the beard;—the *second*, the arrest of the particles of dust and grit by the hair of the beard and whiskers, and thus relieving the eyes.

Without at all going into the question as to the propriety of wearing the beard and whiskers, I mention these facts as likely to prove useful in reply to some of the questions in the special memorandum, but I will observe, in conclusion, that there is a great deal of sympathy between the beard and the eyes, and an abundance of evidence could be brought forward to prove it.

Mr. White Cooper, Surgeon to St. Mary's Hospital, reports:—

Chips of Metal, causing injuries to *Turners in Metal, Fitters, Hammermen, Cutlers.*

The injuries inflicted on the eyes by chips of metal are highly serious—1st. From the force with which they strike the eye causing (*a*) extinction of sight from concussion; (*b*) severe penetrating wounds, the fragments often burying themselves in the eyeball. 2nd. From the chips being more or less heated, sometimes red-hot.

Sparks, causing injury to *Foundry-men, Blacksmiths.*

A very common accident with these men is an ignited spark becoming fixed in the cornea, from whence it has to be picked out: a stain is often left, and I have seen instances in which the sight has been impaired by frequent repetition of this accident.

Chips of Stone, causing injury to *Stone-cutters* and *Carvers, Masons, Breakers of Stones on the Highways, Quarrymen.*

In working sandstone or the other softer stones, comparatively little force is required, and if the eyes are struck by chips the injuries are slight; not so in breaking granite or flints; the sharp fragments of flint will penetrate the eye like chips of metal, as I have repeatedly seen, and, from the force required, severe injuries are often received in working granite.

Grit.—Since the introduction of railways, instances are constantly occurring in which sharp angular particles of coke strike the eyes, and often become impacted in the cornea. Whether there or under the lid, they cause excessive irritation, and sometimes violent inflammation. Besides the *Guards, Travellers in open cars* (used on some lines) are especially liable to this injury.

Lime.—Very formidable injuries are inflicted on the eyes by lime, of which I have seen examples in *Masons, Bricklayers, Hodmen,* and *Limeburners.*

Gunpowder.—*Miners, Firework-makers, Rock-blasters,* and *Quarrymen,* are liable to injury of the eyes from the explosion of gunpowder. Besides the burn, grains of powder are often driven into the eye, and unless every particle is carefully picked out, an indelible stain remains.

Dust and Flue.—*Millers, Chimney-sweeps, Mortar-mixers, Dustmen, Drug-grinders,* are exposed to the pernicious influence of dust, *Grinders of steel* to metallic dust, *Workers* in *cotton** and *Wool* and *Feather Cleaners* to flue.

The most common effect of dust is chronic inflammation of the outer covering of the eye and the lining membrane of the eyelids, not unfrequently attended with disease of the margins of the lids, causing loss or misdirection of the eyelashes. The dust of cantharides will sometimes excite violent inflammations of the eyes.

Deficiency of Light.—The classes of persons who, according to my experience, suffer from this in the greatest degree, are tailors, sempstresses, glove makers, and workers with the needle generally, who follow their occupation in ill-lighted and ill-ventilated rooms. The strain upon their eyes is great under ordinary circumstances, but is especially so when they have to work on black materials. For instance, I have invariably found that a general mourning increased the number of applicants for relief at the Ophthalmic Institutions to which I am attached.

Overstraining the Eyes.—This leads me to state that the number of persons who suffer from overwork of the eyes in this metropolis is very great. On referring to my records I find that *thirteen hundred and twenty* such cases came under my notice in nine years, the large majority being tailors, shoemakers, and female workers with the needle. It is not the mere employment *per se* which appears to be productive of so much harm, but the circumstances under which it is conducted and the excess to which it is carried. I have been repeatedly told by milliners that twelve, fourteen, or sixteen hours a day was the ordinary duration of their labours, and this often in foul and badly-ventilated apartments. Milliners and tailors are especially liable to suffer from extraordinary demands upon their powers of endurance; a large amount of work has to be completed in a limited time; this involves the loss of sleep and close confinement in an atmosphere loaded with impurities and heated to an exhausting extent. To recruit their powers stimulants are taken freely by the men, and thus a combination of evils exists which are equally pernicious to the organs of vision and the general health.

Excess of Light.—1st. Degree, *Glass blowers, Metal smelters.* 2nd Degree, *Retort men, Bakers,* (*oven work,*) *Cooks.*

The intense excitement of the retina, produced by the glare and heat proceeding from the liquid glass and metal, frequently terminates in amaurosis.

The same injurious effect may arise from the occupations placed in the 2nd degree; but chronic inflammations of the outer coverings of the eye are a more common result.

There is a large number of persons engaged in occupations of various sorts, whose eyes are seriously injured from their working by gaslights, which lights are placed before them casting the full heat and glare upon their faces.

The following sugestions have reference to the prevention of injury to the eyes from artificial light.

A. Colour of Light.—To fully understand the object to be attained, it is necessary to bear in mind that daylight is composed of the three primary colours in the following proportions:—yellow 3, red 5, blue 8.

The red and the yellow rays are the most exciting to the eyes, and in direct proportion as artificial light possesses them in excess, is it fatiguing and injurious to those organs.

The bad effects, however, may be obviated, 1st. by surrounding the flame with a chimney tinged pale blue; 2nd. By surrounding the light with a shade coloured azure blue on the inner side; 3rd. By transmitting the light through fluid tinged blue with ammoniuret of copper.

In all these contrivances the colour of the light is improved by the addition of the deficient blue rays.

B. Position of Light.—A frequent cause of the injurious effects of artificial light is the direct and concentrated manner in which it is permitted to fall upon the eyes. No light should be placed in front of the eyes, but should either be above the head, or rather behind, and on one side, so that the object can be well illuminated, whilst the eyes are fully protected from the heat and glare.

C. Unsteadiness of the Flame.—The steadier the flame the better for the eyes; lights should, therefore, have glass chimneys, to assist combustion and prevent flickering.

D. Heat and Dryness.—This cannot be avoided in rooms heated with hot air, nor where there are many lights; but it may be obviated by placing, in some convenient situation, a flat dish containing water; and those engaged in work requiring a strong light should place a large wet sponge near them, to cool and moisten the air by its evaporation.

E. Eye Shades.—When circumstances compel artisans or others to work with lights before them, the eyes may be advantageously protected by shades worn on the face. The ordinary shades have had the objection of heating the forehead and eyes, by not allowing of the escape of the vapour from them. An optician, has, at my suggestion, made a shade working on hinges, which does away with the objection by allowing of ventilation, and it can also be adjusted at any angle most convenient to the wearer.

The simplest and least expensive contrivance for protecting the eyes from chip or grit is a cup, of fine wire, made to completely surround the eye, connected to its fellow and retained in place by elastic bands. These are commonly used by railway guards, and are especially adapted for stone-breakers.

Dust or Flue.—The eyes may be protected from dust or flue by cups of papier maché, having a piece of glass fixed in front.

Steel Dust.—Grinders and polishers of steel, whose eyes are liable to be injured by fine metallic dust, might use with advantage an apparatus similar in form to the above, but having magnetised wire in place of the glass. This would be cooler, and would arrest the particles of dust before they reached the eyes.

Excess of Light.—Glass-blowers and smelters would find advantage from the use of eye-pieces covered with double gauze or crape, and retained in place by elastic bands; or even a spectacle-frame, with large circular eye-pieces covered with the above materials, would be a considerable protection. Neutral-tinted glass and metallic gauze would be objectionable on account of their speedily acquiring and retaining heat.

It may here be remarked that *full blue* and *green* glasses, which are often worn by persons having weak eyes, are highly objectionable, being of definite colours, and exciting complementary colours. Neutral-tinted glasses being, as the name implies, of no definite hue, screen the eyes from all colours alike, and produce an effect most grateful to irritable eyes.

Dust and Flue.—A simple and efficacious mode of cleansing the eyes would be by having suspended, in cotton and other manufactories, douches for the use of the work-people. In the accompanying sketch (page 126) A is a cistern, capable of holding three or four gallons of water, and fastened to the wall; it is open at the top, to admit of its being filled, and closed by a well-fitted lid, to exclude impurities; a funnel-shaped zinc tube, furnished with a fine strainer, is attached to the bottom. From this extends a pipe (B) of quarter-inch bore; the end is curved, and furnished with a stop-cock, and a rose is attached; D is a zinc basin, furnished with an ordinary plug and waste-pipe, into which the water falls.

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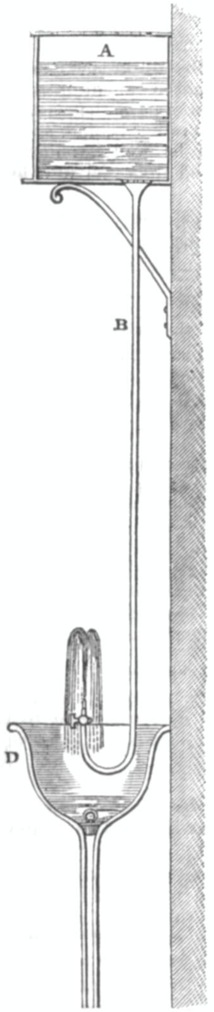
* According to the census for Ireland, 1851, 18 blind persons had been smiths, 100 engaged in spinning, and 73 weavers or weavers' assistants.



By simply holding the face on the rose, and turning the cock more or less, a regulated jet of water can be thrown upon the eyelids, which would effectually remove all impurities and afford the eyes a most refreshing bath.

Mr. Wilde, of Dublin, was the first to recommend this description of douche for hospitals.

Use of Glasses.—Artisans are much in the habit of resorting to magnifying glasses, or "clearers" as they are called, for the purpose of assisting their sight. By enlarging the object they certainly make it more visible, but such glasses improperly used, are often exceedingly injurious to the eyes, increasing congestion and exciting a sensation of straining in them and over the brows. As a general rule, glasses ought never to be resorted to without the sanction of a person acquainted with diseases of the eyes.

Magnifiers. — Watchmakers and other artists who work with a magnifier should never acquire the habit of using one eye only; the glass should be applied to the eyes alternately; by so doing, rest, and an opportunity of recovering from the fatigue produced by the exertion of looking through the magnifier, would be afforded to each.

In conclusion, I shall offer a few general remarks.

The Reports of Eye Infirmaries show that a considerable number of persons present themselves with injuries to the eyes, mechanical and chemical. For example, in the ten years inclusive from 1839 to 1848, of 65,353 patients treated at the Royal Ophthalmic Hospital, Moorfields, 2303 were for wounds of the eyes: of 11,052 applicants at the North London Eye Infirmary, also in ten years, 342 suffered from the same cause; and of 11,233 cases which presented themselves at St. Mark's Hospital, Dublin, 463 were examples of injuries of the eyes and their appendages.

Nevertheless, injuries bear but a small proportion to the enormous number of cases of overwork of the eyes, varying in degree from slight derangement of sight to absolute blindness; but all interfering more or less with the due use of the organs of vision. For example, in the slightest case, the patients are recommended, as an essential part of the treatment, to pause from time to time when working, and give their eyes rest: in the more aggravated cases, the patients find prolonged repose indispensable. Now this very resting of the eyes is an interruption to their work, and as that has generally to be completed in a limited time, the number of hours devoted to it are necessarily increased at the expense of sleep and exercise.

I have no hesitation in expressing my conviction that the general use of sewing-machines would be of incalculable benefit as regards the sight of artisans; they would do away with one of the most fertile sources of ocular disease, and would tend to diminish materially the number of persons who from a comparatively early age are sufferers from imperfect vision.

It has been already stated that insufficient light and bad ventilation are fertile sources of mischief. These will doubtless decrease as improvements in the dwellings of the poor become more general, for the sufferers are mostly the inhabitants of miserable dark rooms, the windows of which are often purposely fastened up, and the apologies for panes of glass so begrimed with filth that light can scarcely enter. It must, however, be borne in mind that the evil of bad ventilation applies equally to the great rooms in which large numbers of work-people are congregated together. It is in the power of the proprietors of establishments of this description to prevent serious mischief to the eyes of those in their employment by making due provision for ventilation, and by carrying out such suggestions as those contained in this report as to the character and position of the lights in the rooms. It would be easy and inexpensive to arrange them in such a manner that the illumination would be good, and the workpeople not distressed by heat and glare. The vigour and energy with which work would be carried on in cool, well-lighted, well-ventilated apartments, would satisfactorily prove that attention to such points would be as conducive to the interests of the employer as to the health and comfort of the employed.

None of those who have sent communications to the Committee, have noticed the effect of ground glass. They have, however, reason to believe, that harm is often done by the use of this medium for the transmission of light. The intention is to diminish the ill effects of glare on the eye, and to a certain extent that purpose is effected; and if it were necessary to look at the source of light at all—if it were desirable that the direct rays from the illuminating power should fall on the eye—then ground glass would be useful. But as it is, the effect is to diminish the supply of light to the work as well as to the eye, and at the same time to diffuse it about the apartment, instead of directing it aright. So that in reality this glass causes the workman to experience a deficiency of light, unless he increases it to its former intensity.

As a *resume* of the foregoing information it may be stated,

1. That the following classes of artizans are exposed to injury of the eyes from chips, splinters, dust, grit, or fluff, viz., engineers, masons, stonecutters, stonebreakers, bricklayers, soda water bottlers, turners, fitters, hammermen and smiths, cutlers, railway guards, rock blasters and quarrymen, millers, chimney-sweeps, workers in cotton, flax dressers, feather cleaners, drug grinders, (especially in grinding blistering flies) shoemakers (from breaking of the awl); and that the following appliances have been found useful in preventing the ill consequences of such exposure, viz., for those liable to blows from large portions of hard substances, such as stonebreakers, &c., coarse metal netting as eye guards, and for those exposed to the finer dust, crape spectacles, while at the same time free ventilation of the apartments they work in would relieve much of the inconvenience.

2. That the following suffer from the chemical

nature of the substances which, in the shape of solid particles get under the eyelids, viz., bricklayers, workers in lime, workers in potash.

No special preventive seems to be here pointed out beyond the placing within reach of the workmen the ready means of immediately cleansing the parts with pure water. Some such apparatus as that described in Mr. White Cooper's communication might be placed in the workshop or superintendent's office.

(The action of chemical fumes, strictly so-called, has not been reported to cause injury.)

3. That the following suffer from excess of light or glare proceeding from the material used, viz., furnace men, gilders, bookbinders.

No practical remedy for this inconvenience has been suggested, as spectacles which intercept the light would diminish the efficiency of the workman.

It may be observed that there is a great difference between excessive illumination of the work, and excess of light on the eye. The latter is the most common, and is considered under a separate head.

4. That the following suffer from deficiency of light, viz., dressmakers, tailors, sempstresses, cobblers, and, in fact all who, having to direct the needle to a definite spot, are unable to command the requisite amount of direct illumination.

5. That the ill effects of deficiency of light are much aggravated by working long on the same material or colour. The remedies for this and the foregoing evil are, increase of light and variety of work.

6. That flickering of light is a great evil, which is felt much by compositors and all who work at minute objects by gas illumination.

The simple remedy for this is the employment of glass chimneys.

7. It seems improper that an equal quantity of artificial light should fall on the work and on the eyes of the workman. If that is the case the latter become overstrained.

This evil, when it occurs, is easily obviated by shades to the light, which defend the eye, and throw the illumination on the required object. The shades should be made of white or light coloured material, so as to reflect as much light as possible. Ground glass between the light and the worker is injurious, by intercepting and diffusing the illumination instead of directing it on to the object.

8. It seems doubtful whether heat and cold have much ill influences over the healthy eye; but when it is in a weak irritated condition, there is no doubt but that they are injurious.

9. Bad ventilation, constrained postures, overindulgence in spirituous liquors, the fumes of tobacco, and all other violations of healthy habits, are injurious to the eyes at the same time as to the rest of the body, and aggravate the bad effects of the above-named industrial occupations.

10. The employment of the eye when the body is in an exhausted state from want of food, prolonged working hours, mental distress, &c., even in handicrafts not of themselves pernicious, is very detrimental to the organ. So that the later periods of work are those which are found most materially to weaken the sight and injure the eye.

The shortening of working hours would probably be a saving in the end to both master and artisan; for the faulty execution of that which is completed with an imperfect organ must be a loss to the former, while the latter is ill remunerated by slightly increased wages for the risk of illness which he runs.

11. The diffusion of knowledge bearing on the health of artizans by means of *Class Journals*, is worthy of the serious consideration of the philanthropist.

The Committee beg to report, that they have prepared a list of "Desiderata" in the department of Industrial Pathology, for the Exhibition of the Society, that is, of inventions required to protect the lives and health of working persons in various occupations; which list they recommend to be published and circulated.

They beg also to recommend, for special inquiry during the current year, as the basis of a report to be prepared by the ensuing January, either

The accidents which occur from the faulty construction of machinery, scaffolding, shipping, and other mechanical contrivances; or

The injury to health arising from the inhalation of dust, grit, fluff, and similar foreign matters; or

The effects of the exposure to damp and cold, rendered necessary by some employments.

T. K. CHAMBERS, M.D., *Reporter.*
JOHN SIMON, F.R.S
T. TWINING, JUN.

SHIPWRECKS BY LIGHTNING.

The following is extracted from an interesting paper which has just been presented to Parliament:

An historical record of well-authenticated instances in which ships and vessels of the Royal Navy have been exposed under various circumstances to the destructive agency of lightning, cannot but prove of great nautical and philosophical interest, beside that it is really of much importance to a maritime country such as Britain to know the probable amount of damage its fleets may sustain at any given instant, through the irresistible operation of one of those mysterious and unsparing natural agencies to which they are so frequently exposed. On the other hand, it is a main object of physical research to discover how and in what way a subtle elementary force in nature such as electricity displays itself, what is the amount of its mechanical or chemical action, and the meteorological and other changes by which it is attended.

Some idea may be formed of the ruinous effects of lightning in the public service by an analysis of 280 instances in which ships of the Royal Navy have been damaged by the unsparing action of the electrical discharge. In order that no doubt or obscurity may arise as to the facts, the names of the ships, dates, and circumstances, as taken from the official log-books and other records, are given in an Appendix. It is not possible to ascertain every case which has occurred, or, could we treat such in detail, that would be, in fact, to write a painful history of the most unparalleled and afflicting calamity. The *Thisbe* frigate was struck by lightning off Scilly, in January, 1786. It is not a solitary instance—the *Lowestoffe*, a sister ship, was set on fire and dismasted in a similar way in March, 1796.

The cases quoted may be taken, with slight exceptions, as having happened between the years 1790 and 1840, comprising a period of about fifty years. They include 106 ships-of-the-line, 70 frigates, 80 sloops and brigs, 2 schooners, 7 cutters, 5 sheer hulks, 5 ships in ordinary, 5 steamers (2 built of iron); no kind or class of vessel therefore has escaped. The following are the results of a careful analysis of these cases:—

There were damaged or destroyed at least 185 lower masts, of which 135, or nearly three-fourths, were lower masts of line-of-battle ships and frigates; full 100 were completely ruined as masts;* of topmasts, 180 were ruined or damaged; more than two-thirds were the topmasts of ships-of-the line and frigates; nearly all were either destroyed or ruined as spars; of topgallantmasts about 150 were destroyed, the greater part of which also belonged to large ships. In addition to this we find a serious amount of rigging and sails, and other stores, either ruined or completely destroyed, or what is called expended.

In about one-eighth of the cases the ships were set on fire in some parts of the masts, sails, or rigging, and in great peril, and in some instances severely damaged in the hull.

The total loss to the country in material alone could not have been far short of £150,000 upon these cases only. Taking into the account every contingency and the number of ships at sea, the public expenditure, on account of damage done to its navy by lightning, would, upon a moderate estimate, be from £7,000 to £10,000 a year upon twenty-three years of the war, between the years 1792 and 1815 and from £1,000 to £3,000 a year upon twenty-three years of the subsequent peace.

Besides this great destruction of material, we find in these cases a serious loss of life or injury to our seamen. Nearly 100 seamen were killed, 250 and upwards dangerously hurt, and full 200 struck down on the decks; in some cases 20 to 40 at one time. The Repulse, 74, No. 162, lost seven men killed on the spot, and ten more were so disabled as to be of little use to the service after. The Sultan, 74, No. 203, had seven men killed at once; and in the Thunderer, 74, No. 219, all the watch in the maintop were paralysed, and had to be lowered down by ropes.

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The recorded instances of the effects of lightning in the merchant navy are quite appalling.

At least 18 merchant ships, varying from 300 to 800 tons each, are known to have been totally destroyed by this terrible agency within the last 20 years.

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The vast amount of destruction by lightning to ships would certainly have never occurred had any efficient method of electrical conductors been invented, applicable to all the variable and complicated conditions under which the general structure of a ship in all its casualties might become placed. Ships in former times, and to a great extent even in the present, were either unprovided with any means of parrying the electrical shock, or if provided with them, the conductors in use were of such small capacity, so partially and ill-applied, and so dependent on the prejudices of sailors for due care and attention to them, that very little advantage seems to have arisen out of this means of preservation in lightning storms.

CAPACIOUS AND PERMANENTLY FIXED CONDUCTORS.

In 1820, Mr. Snow Harris, having devoted himself to the investigation of the question of the defence of the Royal Navy from lightning, and the nature and effects of the electrical discharge, proposed to the Board of Admiralty a new method of capacious electrical conductors, to be permanently fixed and systematically applied upon demonstrable scientific principles, along the masts and generally throughout the hull of a ship, so as to make the vessel itself integrally secure from lightning at all times, and under all circumstances, without the officers and crew of the ship incurring any responsibility whatever for due attention to the conductors, or care in handling, placing, or replacing them, as in the case of the ordinary chains applied as rigging.

Upon the faith of original physical researches, printed in the Transactions of the Royal Society, and in other philosophical works, the inventor was led to discard the prevailing notions relative to the nature and operation of the electrical discharge, as exhibited under the form of lightning; without stopping to inquire whether electrical phenomena were dependent on an invisible fluid or fluids, attractable or attractive of certain kinds of matter, or of matter generally, he came at once to the immediate elementary result, deducible from an immense induction of facts, as recorded in the official log-books of the British navy, and in other authentic records, viz., that what we commonly call lightning is an explosive form of action of some unknown natural agency, when forcing a path, as it were, through matter, the constitution of which is such as to resist its progress, such bodies, for example, as atmospheric air, glass, pitch, wood, &c., &c., whilst in falling upon other kinds of matter, such as the metals, the constitution of which is such as to oppose but a small resistance to its progress, this explosive form of action we term lightning is no longer apparent, but is converted as it were into a sort of comparatively quiescent current, the expansive force of which is always in some direct ratio of the resistance opposed to it. That the dominant law which determines the course of a stroke of lightning and its usually attendant destructive effects, is altogether dependant on this great truth. So far as the unknown agency we term electricity is concerned, Cavendish has shown that all kinds of matter are, in respect of any peculiar specific attraction, alike indifferent to it; that an equal division of an electrical charge always obtains between bodies, without regard to the kind of matter of which they consist; the French philosopher, Coulombe, arrived at a similar result. That, in the progress of a stroke of lightning, the electrical agency, whatever it be, seeks to pursue the least resisting course between certain surfaces of action, represented in nature by the clouds, land, or sea. If metallic bodies be present, and they happen to be in a position favourable to the progress of the electrical agency, then they become subject to the force of the discharge; but if not in such a position, then the discharge assails other bodies. The whole, therefore, of the path of the electrical discharge is resolvable into a question of resistance and distance.

Admitting the truth of this great general principle, Mr. Harris came to the conclusion that if a ship were non-resisting in all its parts in respect of the electrical discharge, no damage would arise to it when assailed by lightning, since, at the instant of the explosion falling upon any point, the explosive form of action would vanish, and would become converted into what may be considered as comparatively quiescent currents of electricity, having unlimited expansion in all directions upon the surface of the sea, that is, upon one of the surfaces to which, by a law of nature, the discharge tends. To arrive, therefore, at very perfect security from lightning on shipboard, he concluded that we should endeavour to bring the general fabric into that passive or non-resisting state it would have, supposing the whole structure were a mass of metal. The proposal then was, upon the faith of these principles, to fix capacious conductors in the masts, and to unite these with the metallic masses in the hull and with the sea, so as to give the electrical discharge unlimited room of expansion in all directions, by which the explosive form of action we call lightning would vanish. Although a method of applying lightning conductors in ships under a fixed form had been long called for, yet was this proposal received at first with much apprehension, as being calculated to draw down lightning upon the vessel. Many naval officers thought it impossible to contrive a conductor in the way proposed, such as would stand the strain and flexure of the spars under sail; so that it was not until further, and repeated, and distressing damage to the navy by lightning had occurred, that the Board of Admiralty determined, after ten years had elapsed, to give Mr. Harris's system a trial, contrary to the opinion of many prejudiced persons, who predicted the destruction of the ships in which the new conductors had been placed.

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* A 74-gun ship's mainmast, of Riga spars, has cost in the war £1,008, and £848 since the peace; a maintopmast £140 nearly; when made of other spars, the cost has been less, but it has been occasionally still very considerable. The cost of the mainmast of a three-deck ship reached during the last war £1,400.

It may be here observed that, in consequence of Sir Snow Harris's scientific inquiries, the results of which have been published in the transactions of learned societies, as also on many occasions in a separate form, a vast amount of prejudice on the subject of lightning has been dispelled, and the progress of useful knowledge greatly advanced in the Royal Navy. When this plan was first proposed, viz., in 1820, now more than thirty years since, very unsound views and very singular prejudices prevailed, especially amongst sailors, relative to the agency of lightning. Every piece of metal was considered as an attractor, and hence a source of destruction. It was customary to put wet swabs into the pumps and over the doors of the magazines, with a view to keep out the lightning. Vulgar prejudices of this kind certainly retarded a complete and effectual preservation of the navy from lightning for a period of at least twenty years.

The system as now applied in the ships of her Britannic Majesty's navy is as follows:—Lines of metal are incorporated with the several masts throughout their entire length, from the truck aloft to the heel of the lower masts; the lines of metal consist of copper plates, in series of lengths of about four feet, varying from one and a half to four inches in width, and 1-16th to 1-8th of an inch in thickness. These plates are carefully cut by a circular saw so as to be everywhere parallel, and are otherwise prepared for fixing; they are conjoined in two layers, of 1-8th and 1-16th of an inch thick, an upper and under layer, and are so placed as to cause the butts or joints of the one to fall under or over the continuous portions of the other. In this way we obtain a continuous line of metal, in a series of shut joints, calculated to yield to any flexure of the spars under a press of sail, without disturbing the line of conduction. The plates are secured in shallow grooves, ploughed out of the aft sides of the several spars, by means of appropriate planes or other tools; they, the plates, are turned round the several mast-heads, so as to unite with the metallic lines on the next mast, through the caps in which they are supported: the plates are finally turned round the heel of the lower mast, and rest upon similar plates which surround and envelope the step; these again unite with other similar lines of metal, connecting all the keelson bolts driven through the keel to the copper sheathing outside the ship. Similar lines of metal pass transversely under the beams from the points of the deck in which the masts are placed to the sides of the ship, and there unite with the iron knees and bolts driven through the planking and framework to the copper expanded on the bottom; these transverse lines of metal unite with the lines of metal on the masts, as they pass into the ship. There are other similar lines of metal passing from the foremast to the stem, and from the mizenmast to the stern-post; and thus we see that the whole fabric, from the truck to the sea, may be considered, in an electrical sense, as one uniformly conducting mass; so that when lightning strikes upon any point, the explosive form of action vanishes, the electrical discharge has unlimited room of expansion in all directions, and no damage can arise to the ship, as experience of the preservation of the Royal Navy of this country fully shows.

Moreover, this system fulfils all the conditions essential to a practical application of lightning conductors in ships; it had been the great defect of the temporary chains hitherto used that the conductor was partially, not generally, applied, being of small calibre, and liable to all the damage incidental to a ship's rigging, seldom in place when required, always a source of trouble and anxiety to the officers and crew of the vessel, who were held responsible for its repair and due application, and who were always exposed to danger whilst handling it in thunder storms.

Now, in the case of a permanently fixed system, such as that just described, forming an integral part of the ship itself, all these difficulties vanish, *e.g.*, the conductors by which the safety of the general structure is insured are quite independent of the crew of the ship, are always in place, always ready to meet the most unexpected danger; and whilst clear of the standing and running rigging, they admit of every possible motion of the spars, one on the other; or of any portion of the mast being removed, either by accident or design, without interfering in the least degree with the required security; being independent of the crew, the sailors are not required to meddle in any way with the conductors, to their great peril and annoyance. Finally, a discharge of lightning falling upon any given point cannot enter upon any course of which the fixed lines of conduction do not form a part; so that this system fulfils strictly all the conditions essential to perfect security.

Sir Snow Harris has shown, in his various papers on this subject, that this system is in accordance with all the general laws of electrical discharge; that in whatever position the sliding or moveable portions of the mast be placed, or however circumstanced, the existing conducting lines present a course to the sea, having less resistance than any other which can be assigned, and that hence the mere position, or fracture, or removal of any portion of the mast, is a matter of indifference.

It will be immediately perceived, on a very slight review of these elementary principles, that the method of electrical conductors to ships proposed by Sir Snow Harris resolves itself into a great general system, by which a ship is effectually secured against lightning in all its parts as a whole, upon demonstrable scientific principles; it hence differs essentially from the common methods of application of a small wire or metallic chain applied as rigging, and which has been not unfrequently applied, in a very hypothetical way, for good or evil, as a sort of nostrum, calculated to draw down lightning upon itself and thereby protect other parts of the vessel; charming as it were to rest the otherwise unruly spirit of the storm. This at once marks the difference between the new method of lightning conductors for ships and that of the ordinary methods after the lightning rods of Franklin, a question not unfrequently asked by naval men. The large amount of experience of the new system in the Royal Navy for more than a quarter of a century, embracing, as it does, the application of lightning conductors in the most general and unreserved way, has amply resolved all those long-controverted questions relative to lightning rods which engaged the attention of so many eminent philosophers of the last century; *e. g.*, whether metallic conductors are an effectual security against lightning? Whether such substances attract lightning? Whether they prevent explosions of lightning? At what distance does their protecting power extend? All such questions are now no longer problematical.

It may not be unsatisfactory, in the way of evidence, to advert briefly to a few of the most remarkable of these instances of the preservation of her Majesty's ships by lightning, as recorded in official letters and other public documents.

Her Majesty's sloop *Scylla* was struck by lightning at sea, in the West Indies, on 6th August, 1843, at 7 a.m. The ship had just shortened sail to a squall, with a dense black cloud overspreading the sea. This cloud poured forth its terrific lightnings, on the mainmast with an explosion which, to use the captain's expression, "shook the ship to the keelson;" but no damage ensued; the electrical discharge was rapidly transmitted by the conductors through the ship into the sea. The captain of the *Scylla* enclosed a copy of the log to his commander-in-chief, Admiral Sir C. Adam, with this remark, "I cannot omit this opportunity of recording my high opinion of the lightning conductors on Harris's plan, and with which the *Scylla* is fitted; if we had not had them, the mainmast must have been shivered, and perhaps a more serious disaster would have befallen us." She had, according to the log, shortened sailed at 7.50 a.m.; at 8.20 a.m., that is, within about half an hour, sail was made again, and the ordinary duties of the ship went on as if nothing had happened. If this result be compared with such cases as quoted, with that of the Thisbe, for example, then, as must be allowed, it is a vast gain for our navy.*

The case of the *Fisgard*, struck by lightning in the Oregon territory, at 7·45 p.m., 26th of September, 1846, is another important case. Captain Duntz says in his official letter, "Mr. Rodd, the senior lieutenant, is of opinion, from the severity of the shock, that but for the efficiency of the conductors, the mainmast must have been totally destroyed, and much serious damage have occurred, in which opinion I fully coincide." Mr. Rodd was standing on deck, within three yards of the mainmast, when the lightning struck the mast. The vane spindle aloft was melted, and everyone in the ship was under a momentary panic.

Captain Sir Baldwin Walker, in his report of the *Constance*, struck by lightning on the coast of Mexico, on the night of the 19th July, 1847, says, "I cannot speak too highly of the conductors of this ship, which are fitted on Mr. Snow Harris's principle. The thunderstorm was so violent that, had it not been for the perfect way in which they are fitted, our top-gallant masts being housed at the time, this ship would probably have lost her masts, besides being otherwise disabled, which on this coast, during the present bad season, might have been attended with serious consequences."

The official report from Captain Sir Everard Home, of the *Calliope*, struck by a heavy shock of lightning on the 16th July, 1851, on her passage from Hobart Town to Sydney, is another most satisfactory acknowledgment of the value of the conductors. "Captain Home was made aware of what had taken place by seeing a mass of fire as it appeared in the fore part of the cabin, and an explosion as loud as if the gun nearest the door had been fired. The lightning passed out of the ship upon each side. The mast is uninjured." †

The saving to the public exchequer upon the few cases recorded could not have been less than from £20,000 to £30,000, on a moderate computation.

* * * * * *

Now, it is to be observed that within the short space of 16 months, viz., between March, 1846, and July, 1847, no less than ten ships, including four large frigates, were preserved from the usual destructive action of lightning on foreign stations, by which at least £10,000 must have been saved to her Majesty's Treasury.

Former Boards of Admiralty, fully aware of the great practical value of Sir Snow Harris's method of guarding ships against lightning, have required in their contracts for mail boats that his conductors should be provided, and have furnished private builders with plans and instructions for their guidance in fitting them. Private companies, and the owners of many fine merchant ships, have begun to adopt the same method. The ships of foreign powers building in this country are nearly all fitted with the conductors, as in the public service, so that, in fact, the general shipping interest, the merchant and shipowner, the private builder, and powerful private companies are all being benefited by Sir Snow Harris's long and anxious labours.

* * * * * *

Upon a review of this mass of evidence relative to Sir Snow Harris's method of lightning conductors for ships, we arrive necessarily at this most important deduction, viz., the complete security at all times, and under all circumstances, of the Royal Navy from the destructive element of lightning, a proved source of shipwreck in every form; an element which, in former periods of its history, constantly deprived the country of the efficient services of its ships and fleets, wasted the public treasure to a serious amount, and destroyed or crippled its sailors; and this stands proved by the testimony of some of the greatest naval and scientific authorities in the world, by the experience of nearly a quarter of a century, by numerous public documents, including official letters and reports, and by the united opinion and approbation of nearly every naval officer in her Majesty's service.

Home Correspondence.

THE F.S.A. QUESTION.

Sir,—The initials, F.S.A. and F.A.S. would appear indiscriminately to have appertained to, and signified, Fellowship with the Society of Antiquaries from time immemorial. Your correspondent W. H., however, suggests that as unscrupulous use appears already to have been made of the same by, or on behalf of, some members of the Society of Arts, that such a course should be continued by its members in order to raise their position as a Society as high as any others. Now, sir, I have yet to learn that the members of this or any other Society will raise their position by any such conduct. The well-known initials of the Society of Arts, viz., M.S.A., are surely in themselves sufficiently honourable, without our descending to the meanness of strutting in the borrowed plumes of any other Society than our own. And even if the term *membership*, as distinguished from *fellowship*, seems less aristocratic—surely, as we have in the same category with ourselves the Geographical Society, the Royal Society of Literature, the Royal Asiatic Society, and other of the leading Societies which I could name, enjoying the peculiarity of conferring *memberships* and not *fellowships*, we have no great cause for grumbling; rather let us (and with good cause) be proud that the Society of Arts has of late years taken so prominent a position among Societies—by no dissembling of initial titles, be it remembered—but by sheer talent and enterprise. May it always be so distinguished. is the wish of,

Sir, your obedient servant,
F.S.A. *et* M.S.A.

London, Jan. 6, 1855.

Sir,—The advertisement put forth by the Society of Antiquaries, to which your correspondent from Blackburn has alluded, held out the threat that the names of all persons using the above letters as an addition, without being members of that Society, would be *published.* I do not suppose, sir, that any man but an adventurer would, wittingly, use either a title or an addition to which he had no right. Members of the Society of Arts have had letters *addressed* to them with the addition of F.S.A.; but this they could not prevent. They are certainly entitled to *some* addition, as much as the Society of Antiquaries. The letters M.S.A. would be most in accordance with the words of their diploma, and I trust that the Council of our Society will favour them with instructions upon the subject.

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* The case of the Sappho, 18, Appendix 1, presents a most remarkable coincidence in the attendant circumstances; here, however, the spars were knocked in pieces, and ten of the crew either killed or hurt.

Faithfully yours,
M. S. A.

Cheltenham, January 6th, 1855.

Sir,—Your correspondent, "W. H.," in discussing the late determination of the Council of the Society of Antiquaries, asks "why *members* of the Society of Arts should not have an equal standing with those of the Antiquaries, &c.," and be entitled to the initials F.S.A. or F.A.S. The truth is that in all societies wherein the election is almost *nominal*, and requiring no qualification or examination, and open to an unlimited number, the addition of its initials after a member's name confers little or indeed no distinction. The question, however, should not rest here, but deserves consideration as to the possibility of making the initials of the Society a real distinction—an object of ambition and a means of getting good service from its members. It ought to be ascertained if the Society has, or should obtain, power to elect from its body a certain number of *Fellows*, men who have really distinguished themselves in its service, either by their communications, their work on its committees, or their world-acknowledged talent devoted to aid their efforts. I feel little doubt that able men would be attached to the Society by these means and work out its intentions more zealously, *if*,—and this is a serious if,—the distinction were only won by real merit, and the award not made merely by the Council, but by men competent to judge of that merit. The highest medals of the Society would have increased value if such a distinction were added to them, and services which could no otherwise be paid would be rewarded by such an election, if it were limited in number and just in its award.

I am Sir, yours truly,
R. A.

Kensington, Jan. 8th, 1855.

Sir,—Your correspondent, "W. H.," in the last number, opens a question which, I humbly think, ought definitively to be settled by the Society of Arts. The question is, have the constituents of the Society a right to call themselves Fellows, or merely Members. On reference it will be found that the charter speaks only of Members, no allusion being made to Fellows. But then it must be remembered that the word Member is generic in signification, and, as the charter expressly permits of bye-laws being made not beyond its scope, so it would appear permissable to designate some of the constituents, who would necessarily be members, "Fellows," as in like manner some are called Vice-Presidents, &c. But until such a bye-law is made it appears to me we are only members, and that we may violate that noted Act against the assumption of illegal titles in dubbing ourselves Fellows. I cannot help thinking, however, that it is highly expedient that the members of the Society of Arts should be placed on a level with the members of other societies in the use of the conventional symbol, or ornamental appendage, denoting membership. Many societies which offer this coveted honour are of recent origin—most of them had not been called from the vasty deep when our Society was 50 years old. And now we have astronomers, geographers, geologists, zoologists, Linnæists, statists, numismatists, horticulturists, florists—and they are all Fellows; and pray, sir, why should not we be Fellows, *good* Fellows, and so say all of *us*. Are we less numerous than the ——— less respectable than any of them; are our members less distinguished than those of the ———? If they elect by ballot, so do we; if ours is a mixed body so is even the Royal Society, taking away the representatives of *physical* science, the doctors. But not to indulge "in oderus caparisons," as Mrs. Malaprop has it, not one of these societies has for its President a Royal Prince (and so great a Prince), as we have. Membership in certain cases seems to be considered a high honour, as, for instance, Member of Parliament, the highest honour, it is said, that can be conferred on a commoner; Member of the Privy Council, &c. The term, however, when used in connexion with scientific societies, seems to convey an idea of inferiority to that of Fellow, and, therefore, I think it expedient that we should be placed on a level with the societies I have alluded to; or I would venture to suggest the propriety of conferring Fellowship after seven years' probation. I say seven years, because this is the magic term which seems to give so much virtue to barristers in the eyes of our legislators, a barrister of seven years' standing being fit for any of the thousand and one places which Government and the House of Commons are continually creating for them. Sir, permit me to say, in conclusion, that I hope this question will be ventilated in the columns of our Journal, and finally and satisfactorily adjudicated on by the Council.

I am, sir,
Your obedient servant,
C. B.

PRODUCTS FROM COAL—BENZINE.

Sir,—In reply to Mr. Mansfield's letter, which appeared in your valuable Journal, 29th of December, I beg to state that I have no time for newspaper polemics, the more so when it is to prove the priority of an invention. I believe that the best place to discuss such subjects is a Court of Law.

I remain, sir,
Your obedient servant,
F. CRACE CALVERT, F.C.S.

Manchester, Royal Institution, 9th January, 1855.

Proceedings of Institutions.

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Waterford.—Professor Shaw, of Queen's College, Cork, commenced a course of nine lectures "On Heat and the Steam Engine," at the Mechanics' Scientific Institute last Thursday week. The lectures are to be delivered, generally, on alternate evenings. One of the course is "On the pressure and motive power of liquids, gases and vapours."

MEETINGS FOR THE ENSUING WEEK.

Mon. Chemical, 8.
Statistical, 8. Mr. Alfred Waddilove, D.C.L., "On the effect of the Recent Orders in Council in respect to our own Commerce and that of Neutrals."
Royal Instit., 3. Prof. Tyndall, "On Magnetism."
Tues. Civil Engineers, 8. Mr. Rennie, "Description of the Aqueduct of Roque-favour, near Marseilles."
Linnæan, 8.
Pathological, 8.
Wed. London Inst., 7.
Society of Arts, 8. Mr. George Muir, "On the Smoke Nuisance, considered historically, morally, scientifically, and practically."
Geological, 8. 1. Mr. E. Hopkins, "On the Cleavage Structure of Primary Rocks." 2. Mr. Odernheimer, "On the Geology of the Peel River district, Australia."
Thurs. Royal Inst., 3. Mr. W. B. Donne, "On English Literature."
Antiquaries, 8.
Royal, 8½.
Fri. Royal Inst., 8½. Prof. Faraday, "On some Points of Magnetic Philosophy."
Sat. Royal Inst., 3. Dr. J. — Gladstone, "On the Principles of Chemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, Jan. 5th*, 1854.]

Dated 6th October, 1854.

2149. A. Smith, Princes-street—Safety cage for miners.

Dated 16th December, 1854.

2647. D. C. Hewitt, Richmond—Pianofortes.
2649. J. Sykes, Huddersfield—Piecing machines.
2651. T. Forshaw, Manchester—Beetling woven fabrics.
2653. J. Fenton, Low-moor Iron Works—Axles, piston rods, shafts, &c.
2655. R. L. Chance, Birmingham—Glass.
2657. J. Martin, Soho-square—Apparatus for cleaning windows.

Dated 18th December, 1854.

2659. M. Morrison, Chelsea—Preserving paintings on glass.
2663. R. Von Seckendorff, St. Helen's—Sulphuric acid.
2665. T. Hart, 255, George-street, Glasgow—Jacquard apparatus for weaving.
2667. J. Cunningham, West Arthurlie—Starching textile fabrics.
2669. J. Pritchard, Portsea—Screw propellers.

Dated 19th December, 1854.

2670. A. F. J. Favrel, Paris—Machine for beating precious metals.
2672. J. B. Falguière, Marseilles—Propelling vessels.
2673. J. Avery, 32, Essex-street, Strand—Machinery for cutting metallic bars. (A communication.)
2674. F. R. A. Glover, Bury-street, St. James—Carriages.
2675. J. G. Briggs, Kingsland—Fuel.
2676. J. and R. Langridge, Bristol—Corsets.
2677. J. Tucker, Bristol—Ships.
2678. J. Quick, Sumner-street, Southwark—Furnaces.

Sealed 20th December, 1854.

2679. W. Bittleston, sen., 26, Mary-street—Ploughs.
2680. R. B. Huygens, Holland—Ordnance and fire-arms and projectiles.
2681. J. Paul, Manchester—Paper staining.
2682. J. Higgins, Oldham—Steam boilers.
2684. W. Milner, Liverpool—Safes and locks.
2685. A. Cochrane, Kirkton Bleach Works—Starching textile fabrics.
2686. R. Whytoch, and T. Preston, Edinburgh—Twist lace machinery to fabrics.
2687. G. T. Bousfield, Sussex-place, Loughborough-road—Splitting leather. (A communication.)
2688. R. Walker, Glasgow—Telegraphing.

Dated 21st December, 1854.

2689. T. and S. Baker, Liverpool—Lifting and lowering heavy weights.
2690. J. Venables and A. Mann, Burslem—Printing and fixing colours in earthenware and other substances.
2691. G. Bell, 21, Cannon-street West, and G. C. Grimes, Wandsworth—Lucifer matches.
2692. W. Bertram, Woolwich—Iron ships, &c.
2693. W. Greener, Birmingham—Repeating fire-arms and cartridges.
2694. H. Render, Liverpool—Night lights.
2696. G. J. Sculfort, Mauberge, France—Screw plates.
2697. J. Smith, Bedford—Buckle.
2698. J. H. Johnson, 47, Lincoln's-inn-fields—Railway wheels. (A communication.)
2699. J. H. Johnson, 47, Lincoln's-inn-fields—Application of the electrotype or galvano-plastic processes. (A communication.)

Dated 22nd December 1854.

2700. L. J. F. Margueritte, Paris—Sulphuric acid.
2702. J. Hunt, Birmingham—Illumination.
2704. R. Ashworth, and S. Stott, Rochdale—Spinning machinery.
2706. E. Loysel, Paris—Cooking apparatus.
2708. J. H. Johnson, 47, Lincoln's-inn-fields—Electro-magnetic engines. (A communication.)
2710. F. M. Baudouin, Paris—Isolating telegraph wires.

Dated 23rd December, 1854.

2712. B. M. Giroux, Liege—Locks.
2714. J. F. Porter, Besborough-street—Bricks and tiles.
2716. J. KcKelvey, Belfast—Spinning, &c.
2718. A. Henfrey, Turin—Railways for steep gradients and in working same.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2764. S. S. Shipley, Stoke Newington—Fittings for dressing cases—30th December, 1854.
1. E. Frascara, 12, Alfred-place, Bedford-square—Voltaic pile, and the application of its electric fluid either to the decomposition of water, or to enable the gas to replace the steam-power actually in use.—1st January, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed January 5th, 1855.

1499. Joseph Ellisdon, Liverpool—Improvements applicable to reading, lounging, and other chairs.
1521. William Houghton and Robert Hoyle, Bury—Improvements in machinery for spinning and doubling cotton and other fibrous substances.
1591. Richard Roberts, Manchester—Improvements in machinery for preparing to be spun cotton and other fibres.
1631. Alfred Vincent Newton, 66, Chancery-lane—Improvement in the process of converting wood into paper.
1841. William Johnson, 47, Lincoln's-inn-fields—Improvements in the manufacture of carding apparatus for the preparation of fibrous materials.
1917. George Lewis, High Cross street, Leicester—Improvements in the construction of locks.
2227. Peter Armand le Comte de Fontaine Moreau, 4, South-street, Finsbury—Improvements in preventing collisions on railways.
2327. Charles Hargroye, Birmingham—Improvements in annealing cast-iron, or in rendering cast-iron malleable.
2357. Thomas Metcalfe, High-street, Camden town—Improvements in the construction of portable carriages, chairs, and other articles for sitting or reclining upon.
2383. Frederick Smith, York-street, Lambeth—Improved construction of smoke-consuming furnace.

Sealed January 8th, 1855.

1502. William Robinson and Robert Crighton, Manchester—Improvements in machinery or apparatus for rolling metals into suitable shapes or forms.
1506. Felix Lieven Bauwens, Pimlico—Improvements in the manufacture of soap.

Sealed January 9th, 1855.

1517. Thomas Richards Harding, Leeds—Improved mode of doffing fibrous materials from hackle cylinders and gill or porcupine or preparing rollers.
1536. Arthur James Lane, Surbiton—Improvements in breech-loading fire-arms.
1538. John Greenwood, Irwell Springs, near Bacup, and Robert Smith, Bacup—Improvements in sizeing, stiffening, and finishing textile materials or fabrics.
1540. Edwin Travis, Oldham—Improvements in machinery or apparatus for indicating and registering the height of water, and also the pressure of steam in steam boilers or generators.
1546. William Bishop, Boston—Improvements in machinery or apparatus for ticketing or labeling spools, parcels of the same, or other similar parcels.
1552. Astley Paston Price, Margate—Improvements in the distillation of wood and of other vegetable substances.
1622. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the preparation of silk. (A communication.)
1654. François Desiré Molvé and Pierre Martin, Paris—Improvements in heating water for feeding boilers of locomotives and marine steam engines.
1720. John Cunningham, Beith, Ayr—Improvements in the preparation or production of printing surfaces.
1730. Samuel Lucas, Dronfield Foundry, near Sheffield—Improved mode of manufacturing steel.
1746. Jean Baptiste Ambroise Marcelin Jobard, Brussels—New system of pump.
1978. John Norton, Cork—Improvements in the manufacture of ropes, bands, and cordage.
2370. Edme Augustin Chameroy, Paris—Improvements in the junction of sheet metal pipes and apparatus employed therewith.
2384. George Ross, Falcon-square—Improvements applicable to the manufacture of articles of caoutchouc or of compositions of which caoutchouc forms a component part.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Title.	Proprietors' Name.	Address.
Jan. 3.	3675	Cigar and Tobacco Magazine and Rack...	George Dowler..........	Birmingham.
„ 9.	3676	Certain Parts of Folding or Camp Bedsteads	John Thompson	19 Clarendon-villas, Notting-hill.